

Last DSM Algorithm
UPC_EMV Version

11th January 2005

Input Bits

Input Channel	Bit Description
0	CTB Multiplicity Bits 0:15 – Multiplicity
1	VTX Information Bit 0 – BBC TAC difference in window Bit 1 – ZDC TAC difference in window Bit 2 – BBC East small-tile ADC sum over threshold Bit 3 – BBC West small-tile ADC sum over threshold Bit 4 – BBC East large-tile ADC sum over threshold Bit 5 – BBC West large-tile ADC sum over threshold Bit 6 – ZDC East ADC sum over threshold 0 Bit 7 – ZDC West ADC sum over threshold 0 Bit 8 – ZDC East TAC in window Bit 9 – ZDC West TAC in window Bits 10:13 – Unused Bit 14 – ZDC East ADC sum over threshold 1 Bit 15 – ZDC West ADC sum over threshold 1
2	Unused
3	EMC Information Bits 0:1 - Unused Bits 2:3 – BEMC high-tower bits Bit 4 – back-to-back flag Bits 5:8 - Unused Bits 9:10 – EEMC high-tower bits Bits 11:15 - Unused
4	Miscellaneous Information Bit 0 – Blue bunch filled Bit 1 – Yellow bunch filled Bits 2:15 - Unused
5	FPD Information Bit 0 – FPD East ADC sum over threshold 0 Bit 1 – FPD West ADC sum over threshold 0 Bits 2:15 - Unused
6	Special Trigger Requests Bits 0:2 – selected special trigger request (zero if no request) Bits 3:6 – detector number (0:15) of detector making request Bits 7:13 – Unused Bit 14 – Zero-bias bit Bit 15 – Random bit
7	Unused

Registers

Register	Register Description
0	16-bit low threshold for the CTB Multiplicity

1	16-bit medium threshold for the CTB Multiplicity
2	16-bit high threshold for the CTB Multiplicity
3	16-bit low threshold for CTB Multiplicity Window
4	16-bit high threshold for CTB Multiplicity Window

Output Bits

Bit	Description
Bits 0:14	<p>If Bit 15 = 1 – Special Trigger Requests</p> <p>Bits 0:2 – Special Trigger request</p> <p>Bits 3:6 – Special Trigger detector</p> <p>Bit 7 – Random bit</p> <p>Bits 8:15 – Unused, set to 1</p> <p>Else – Physics Data</p> <p>Bits 0:1 – two bits encoding a number between 0 and 3 indicating which of three CTB multiplicity thresholds was passed</p> <p>Bit 2 – BBC TAC difference in window</p> <p>Bit 3 – ZDC TAC difference in window</p> <p>Bit 4 – Both BBC small-tile ADC sums over threshold</p> <p>Bit 5 – Both ZDC ADC sums over threshold 0</p> <p>Bit 6 – Both ZDC TACs in window</p> <p>Bit 7 – UPC_EMC bit</p> <p>Bit 8 - Zero-bias bit</p> <p>Bit 9 - Blue bunch filled AND yellow bunch filled</p> <p>Bits 10:11 – BEMC high-tower bits</p> <p>Bits 12:13 – EEMC high-tower bits</p> <p>Bit 14 – FPD-East OR FPD-West bit set</p>
Bit 15	Flag indicating meaning of bits 0:14
Bits 16:31	Same definitions as bits 0:15

Internal Logic

- The CTB multiplicity is compared to five thresholds whose values are set during RUN configuration (Regs. 0, 1, 2, 3 and 4). The CTB multiplicity is inside the UPC window if it is greater than the threshold set in register 3 and less than the threshold set in register 4.
- The UPC_EMC bit is a combination of the back-to-back bit and the CTB window with vetos provided by the BBC large tiles and the second ZDC threshold:
 - back-to-back flag
 - AND CTB multiplicity in window
 - AND Both ZDC ADC sums not over threshold 1
 - AND Both BBC large-tile ADC sums not over threshold
- A decision is made to pass Physics Data or a Special Trigger Request to the TCU.
 1. The 3 bits of the special trigger request and the random bit are OR'ed together
 2. If ANY of these bits is "1" then output bit 15 will be 1, and the special trigger request and the random bit will be passed to the TCU.
 3. If NONE of these bits is "1" then output bit 15 will be 0 and any physics data will be passed to the TCU.